6. *Description of the Photographs.*

Many of the photographs taken are too faint to reproduce well enough to exhibit completely the striking differences shown between the pairs of spectra. I shall therefore content myself by giving a detailed description of each negative (Table II), only reproducing those photographs which are sufficiently dense to plainly show the phenomena under discussion.

Table II.

No. of negative.	Date.	Star.	Stage of temperature.	Type.	Altitude.	Description.
		From Stage 2 to Stage 4.				
19	7.5.03	α Lyræ	4	Sir.	56°	Faintly red, fairly bright to Hγ.
		α Boötis	2	Arct.	57	Intense red, scarcely extends beyond K.
4	29.12.02	β Ursæ Maj.	4	Sir.	59	Red scarcely visible, maximum about λ 400.
		α Ursæ Maj.	2	Arct.	58	Fairly bright red, maximum about λ 460.
14	17.2.03	α Geminorum	4	Sir.	42	Red scarcely visible, maximum about λ 418.
		α Aurigæ	2	Arct.	39	Fairly bright red, maximum about λ 455.
37	21.1.04	α Geminorum	4	Sir.	68	Weak red, maximum about λ 420.
		α Aurigæ	2	Arct.	68	Very dense red; blue maximum commences at F, centre at λ 460, weak beyond λ 388.
		From Stage 4 to Stage 6.				
11	28.1.03	β Orionis	6	Rig.	21	Red not so intense, and ultra-violet much more extended than in Sirius.
		α Canis Maj.	4	Sir.	22	Dense red, centre of maximum about λ 422.

Table II—*continued.*

No. of negative.	Date.	Star.	Stage of temperature.	Type.	Altitude.	Description.
		From Stage 6 *to Stage* 9.				
35		κ Orionis	9	Alnit.	20°	Although spectrum of Rigel is generally much stronger, that of Alnitam extends as far into the ultra-violet.
		β Orionis	6	Rig.	24	
		Various Intervals.				
34	10.12.03	γ Ursæ Maj.	6	Mark.	78	Faint red, maximum about λ 416, well sustained up to Hθ.
		α Ursæ Maj.	2	Arct.	76	Fairly bright red, maximum at λ 460, rapidly falling off beyond λ 430.
36	14.1.04	η Ursæ Maj.	8	Cruc.	51	Faint red, maximum at about λ 418, bright extension well beyond the end of the Capella spectrum.
		α Aurigæ	2	Arct.	52	Very bright red, maximum at about λ 455, faint beyond K.
23	14.11.03	ε Orionis	9	Alnit.	38	Faint red, centre of maximum at about Hδ. Bright extension far beyond the hydrogen series.
		α Canis Min.	3	Proc.	41	Very bright red, maximum about Hγ, and falls quickly beyond Hκ.
		Extreme Interval.				
33	10.12.03	ε Orionis	9	Alnit.	36	Very faint red, centre of maximum about Hδ, *i.e.*, near the more refrangible end of the Aldebarian spectrum.
		α Tauri	2	Aldeb.	36	Very strong red, centre of maximum about λ 465, end of spectrum about Hδ.

7. *Discussion of Photographs.*

The following is a detailed discussion of the photographs described in Table II.

Stage 2 *to Stage* 4.

No 19. This photograph of Vega (fourth stage), and Arcturus (second stage), is very striking in the relative intensities of the two spectra. The red portion of the Arcturian spectrum is considerably more intense and forms the one end of a maximum which—except in the green region where the plate is not very sensitive—extends from D to about λ 454. The part of the spectrum more refrangible than that rapidly becomes less intense, until at and beyond K it is very faint. Matters are very different in the spectrum of Vega. Here the maximum radiation occurs about a third of the distance from H_δ to H_γ (λ 422) and the spectrum extends without any great falling off in intensity to H_ν, beyond that it is weaker but continues without any great decrease to twice the distance on the more refrangible side of H_ν than the latter is from K. From that point to the end the spectrum gradually declines. Whilst the maximum radiation in this spectrum has moved wholesale towards the ultra-violet, the red is relatively only about half the density of the red in the Arcturian spectrum.

No. 4. The general appearance of these two spectra leads to the conclusion that that of β Ursæ Majoris (fourth stage) is much stronger than that of α Ursæ Majoris (second stage).

A more careful examination, however, shows that whilst the detached red part of the former is only seen with difficulty, the same portion of the latter is comparatively prominent.

The maximum intensity in α is situated at about λ 450 and does not vary a great deal between there and K. After the latter point is reached, however, the fall is rather sudden, and the spectrum soon dies out. In β the maximum intensity is between H and H_ϵ, and the ultra-violet up to H_κ is fairly strong. Beyond H_κ the intensity of the spectrum drops rather suddenly, and then continues with a gradual decrease for some distance.

No. 14. There is no great difference in the lengths of these two spectra, the one of α Geminorum (fourth stage), the other α Aurigæ (second stage), but the red portion of the second stage spectrum is most decidedly more intense than that of the fourth stage, the latter, in fact, being scarcely visible at all. In α Aurigæ the maximum intensity is at about λ 454, but in α Geminorum it must be placed at or near to H_δ (λ 410).

No. 37. In the taking of this negative the spectrum of Capella (second stage) received the advantage of exposure and is consequently much stronger in the H_γ—H_β region than that of Castor (fourth

stage), and yet the latter extends as far into the ultra-violet as the former.

Furthermore, the intensity of the blue part of the spectrum of Capella rises to its maximum immediately at H_β and commences to decline towards the violet at H_γ, whereas the maximum region of Castor does not commence at once after leaving the green gap, and attains its centre at about λ 422.

It will be observed that whether we take Arcturus or Capella to represent Stage 2, the spectra of stars of higher stages have relatively longer ultra-violet and reduced red radiation. It has to be noted, however, that there are indications that Stage 2 will, as a result of further work, have to be divided, for Capella is certainly hotter than Arcturus as determined in the manner now under discussion.

Stage 4 *to Stage* 6.

No. 11. On examination of this negative it is seen that the detached red portion of the spectrum of Sirius (fourth stage) is decidedly more intense than the same portion of the Rigelian spectrum (sixth stage). In the ultra-violet, however, we find that although both stars are fairly high on the temperature curve, and, therefore, both spectra extend far into the ultra-violet, the extension of the spectrum of Rigel is more intense and greater than that of Sirius.

Stage 6 *to Stage* 9.

No. 35. By reason of its greater exposure the spectrum of Rigel (sixth stage) is generally much stronger than that of κ Orionis (ninth stage), and especially is this so in the red portions of the two spectra. This inequality notwithstanding, the spectrum of κ extends practically as far into the ultra-violet as that of Rigel.

Various Intervals.

No. 34. In α Ursæ (second stage) the red part of the spectrum is comparatively very bright, nearly as bright as the region between G and F. In γ Ursæ (sixth stage) this red portion is barely visible. Again, in the α Ursæ spectrum the maximum occurs at λ 460, and then the intensity gradually declines to K, beyond which it is very faint. The maximum intensity of the γ Ursæ spectrum is situated at about λ 422, and it extends without becoming greatly impaired to H_θ.

No. 36. In this comparison we have a very striking case. The spectrum of Capella (second stage) is compared with that of η Ursæ Majoris (eighth stage); Capella has been over-exposed, so that the red portion is abnormally intense, η Ursæ Majoris received the correct exposure, and the red part of the spectrum is rather faint.

Notwithstanding this difference the spectrum of η Ursæ extends further into the ultra-violet than does that of Capella, and not only does it extend further, but the maximum intensity is extended much further into the ultra-violet than is that of Capella, which drops off rapidly beyond K.

No. 23. In this comparison the red part of the Procyon (third stage) spectrum is much brighter than that of Alnitam (ninth stage). The intensity in the longer portion of the spectrum of Procyon rises at once to its maximum at H_β, has its centre of maximum at about λ 460, and at H_γ commences to diminish towards the violet. In the spectrum of Alnitam, however, the maximum is delayed until the region about λ 426 is reached, and is then sustained up to H_ζ, finally extending to the ultra-violet with a marked superiority, comparatively, over that of the Procyon spectrum.

Extreme Interval.

No. 33. This comparison of two type stars respectively situated near the extremities of the temperature curve is naturally one of the most striking pieces of evidence in support of this method of temperature classification. The spectrum of Alnitam (ninth stage) is nowhere so intense as the red and blue parts of the Aldebaran (second stage) spectrum, and yet it extends more than twice as far towards the ultra-violet, from H_β, as the hydrogen series, whilst the more refrangible limit of the Aldebaran spectrum only extends to K. The maximum intensity of the blue portion of the Alnitam spectrum occurs much nearer the ultra-violet than that of the Aldebaran spectrum, the latter attaining its maximum at about λ 465.

8. *Conclusions.*

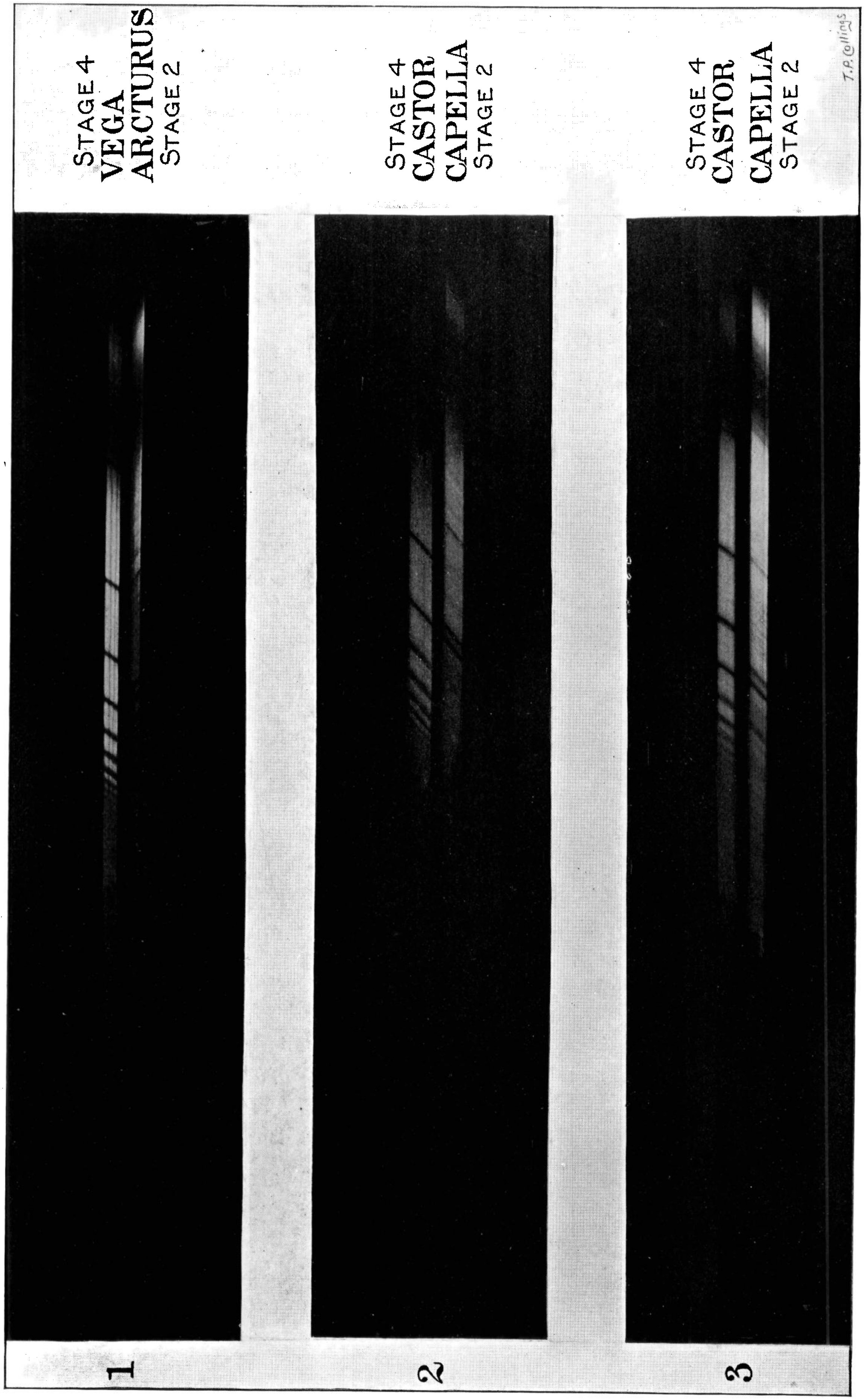
It may be pointed out that the temperature classification, confirmed by this research, does not agree with that published by Sir William and Lady Huggins who, in their "Atlas of Representative Stellar Spectra" containing "a Discussion of the Evolutional Order of the Stars," place the solar stars on a higher temperature level than the white stars.

A reduction of intensity in the continuous spectrum beyond the hydrogen series to which attention has been called by more than one observer, Schumann* among others, does not affect the results which I have stated. Another paper dealing with this and similar points is in course of preparation.

The result of the research may be stated as follows :—

Taking the stars assumed to be hottest in the chemical classification, we find that in all cases the relative length of the spectrum is reduced,

* 'Smithsonian Contributions to Knowledge,' No. 1413, 1903, p. 23.


STAGE 4
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ARCTURUS
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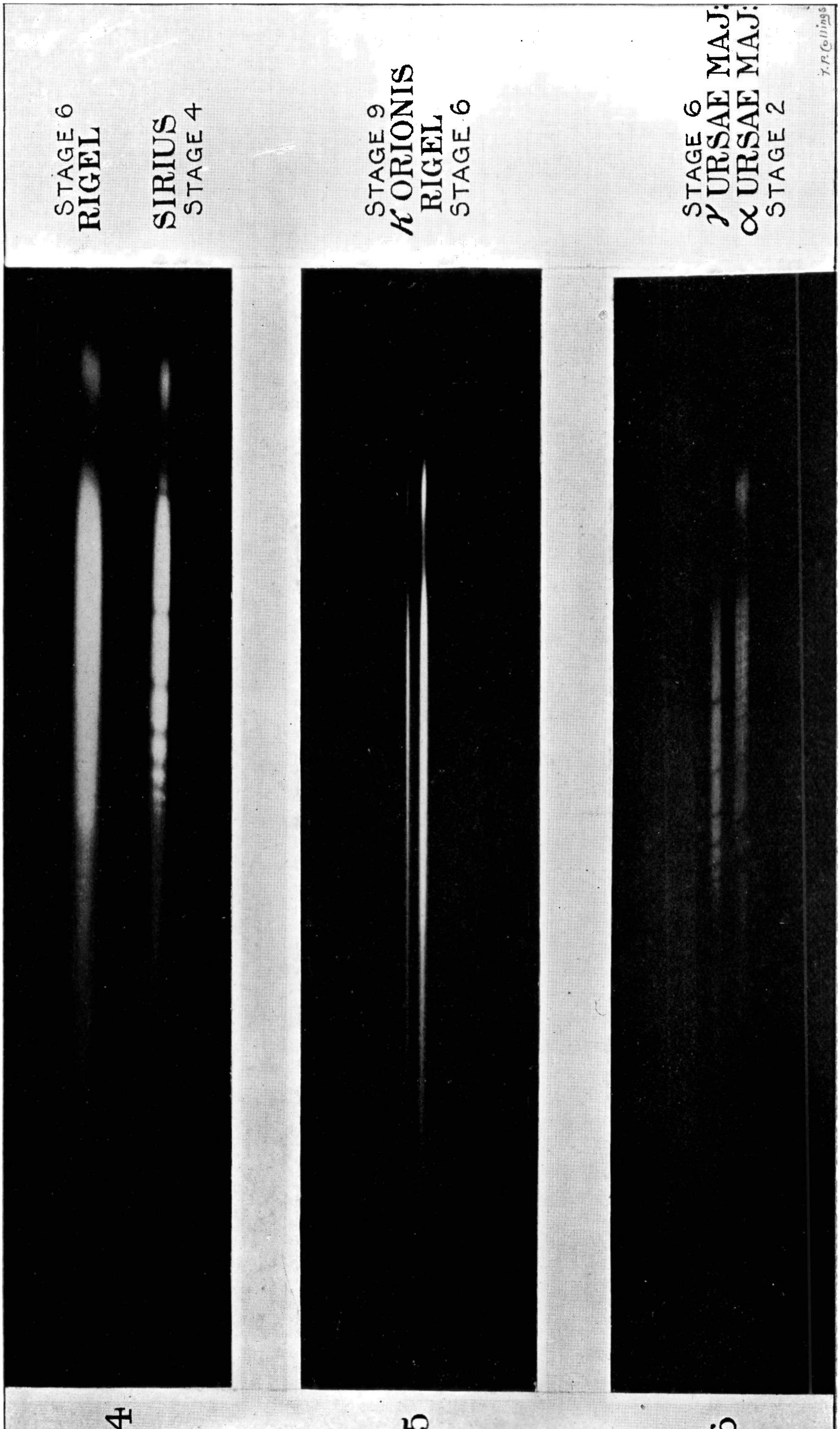
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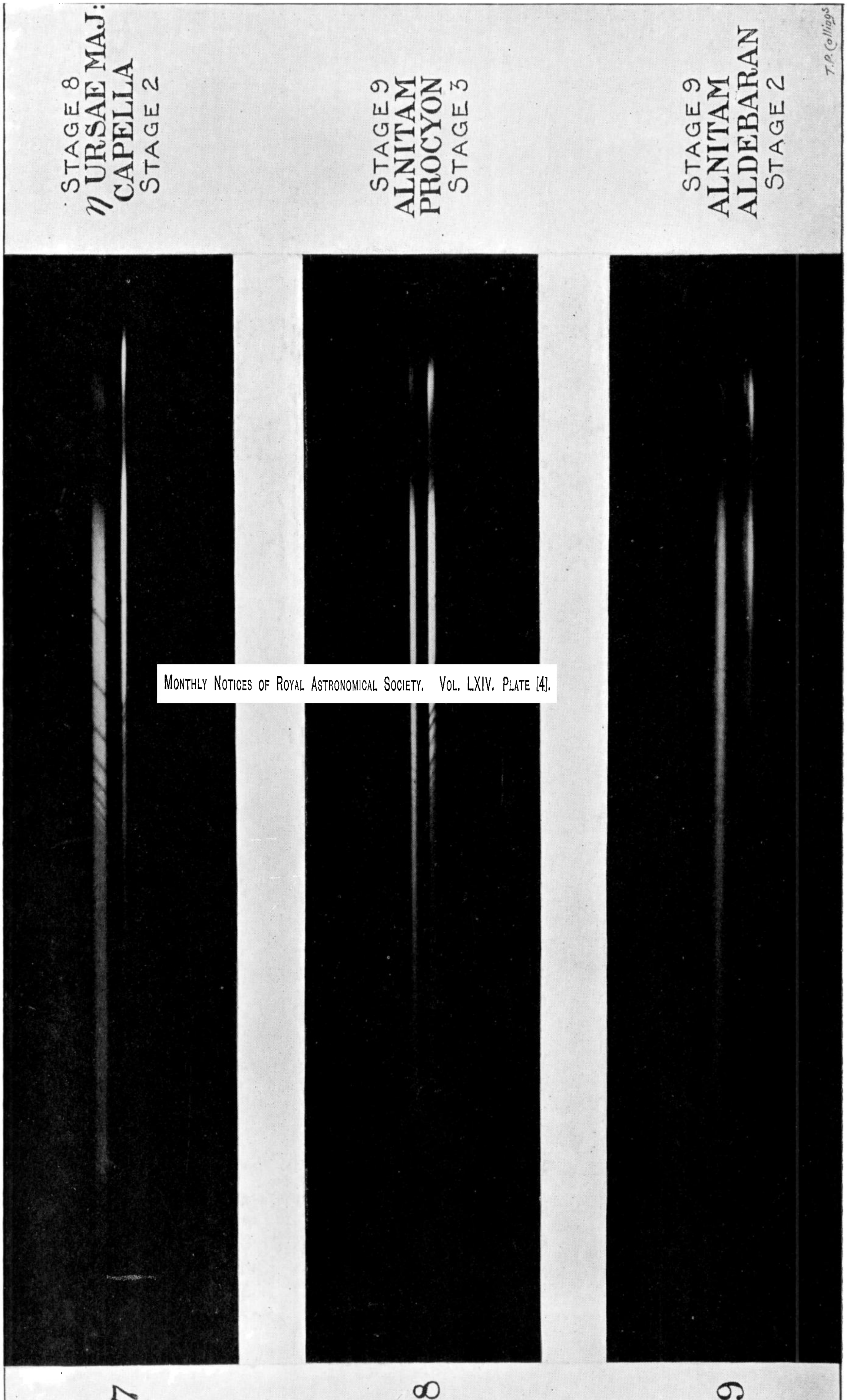
Monthly Notices of Royal Astronomical Society. Vol. LXIV. Plate [4].



and the relative intensity of the red is increased, as a lower temperature is reached. That is to say that where two spectra having their intensities about the region H_β — H_γ equal are compared, we find that in the cooler stars, according to the chemical classification, the emissions in the red preponderate, whilst in the hotter star the ultra-violet is more extended and intense.

My best thanks are due to Messrs. Rolston and Goodson, who took the various photographs to which I have referred, the former also helping me in the preparation of this paper, and to Mr. Wilkie for preparing the enlargements of the negatives.

9. *Description of Plates.*

No.	No. of negative.	Stars.	Stage.	Type.
		Plate [4].		
1	19	Vega	4	Sir.
		Arcturus	2	Arct.
2	14	Castor	4	Sir.
		Capella	2	Arct.
3	37	Castor	4	Sir.
		Capella	2	Arct.
		Plate [5].		
4	11	Rigel	6	Rig.
		Sirius	4	Sir.
5	35	κ Orionis......	9	Alnit.
		Rigel	6	Rig.
6	34	γ Ursæ Maj. ..	6	Mark.
		α Ursæ Maj. ..	2	Arct.
		Plate [6].		
7	36	η Ursæ Maj. ..	8	Cruc.
		Capella.	2	Arct.
8	23	Alnitam	9	Alnit.
		Procyon	3	Proc.
9	33	Alnitam	9	Alnit.
		Aldebaran	2	Aldeb.

In producing these plates the original negatives have been enlarged about $3\frac{1}{2}$ times.

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APPENDIX TO VOL. LXIV.

[*From Proceedings of the Royal Society, Vol. LXXIII.*]

With indication of the original pagination.

No. 3.

CONTENTS.

"The Behaviour of the Short-Period Atmospheric Pressure Variation over the Earth's Surface." By Sir NORMAN LOCKYER, K.C.B., LL.D., F.R.S., and WILLIAM J. S. LOCKYER, Chief Assistant, Solar Physics Observatory, M.A. (Camb.), Ph.D. (Gött.), F.R.A.S. Received April 13,—Read April 28, 1904.

In a paper which we communicated to the Society in June, 1902,* we drew attention to the fact that in our investigation dealing with the percentage frequency of prominences and changes in atmospheric pressures, we found that the pressures in India and Cordoba behaved in an opposite manner, the short period variations of one being the inverse of those of the other; both, however, were closely associated with the prominence frequency.

In a subsequent paper† we showed that these two regions, in which these inverse pressure-variation conditions were clearly distinguishable, were, as far as had then been investigated, of considerable extent, the Indian region extending to Ceylon, Java, Mauritius and Australia, and that of Cordoba to the southern part of the United States.

The facts there collected were stated to be so suggestive that the inquiry was being continued by collecting and discussing observations made in other areas on the earth's surface, so as to note the extent of these similar pressure areas.

The present communication contains the results that have so far been obtained.

The greater portion of the facts here collected has been discussed some time, but as it was considered desirable, before communicating the present paper, to include as many regions on the earth's surface as could be obtained, a longer delay than was anticipated has taken place; even now there are many regions which we have been unable to include. The regions for which further observations are desired include the west coast of Africa, the northern part of South America, and the north-western portion of North America, and Polynesia in the South Pacific Ocean.

In our previous papers we have pointed out the advisability of dividing the year into groups of months according as the pressure is above or below the mean value for the year. In this way the high or the low pressure months can be dealt with separately, if necessary, and any excess or deficiency from a mean value exhibited in either or both of these from year to year can be closely followed.

Such a division of the year can be accurately determined for places

* 'Roy. Soc. Proc.,' vol. 70, p. 500.
† 'Roy. Soc. Proc.,' vol. 71, p. 134.